

Listing of Claims:

Claim 1 (currently amended): A process for the production of a biological product by a microorganism comprising the steps of:

~~selecting~~ providing a microorganism that produces the biological product, and ~~alternately~~ uses oxygen and an alternative oxidant source other than oxygen for cellular respiration;

providing a culture medium suitable for the growth of the microorganism, wherein the medium comprises at least one carbon source;

inoculating the culture medium with a desired cellular concentration of the microorganism;

aerating the culture medium with oxygen, wherein the process has a maximum oxygen ~~supply~~ replenishment rate to the culture medium, wherein the maximum oxygen replenishment rate is defined as the maximum rate of oxygen mass transfer to the medium at any given dissolved oxygen concentration of the culture medium and any given oxygen partial pressure over the culture medium;

supplying the culture medium with a suitable amount of the alternative oxidant source that can be used by the selected microorganism to permit cellular respiration such that when the oxygen requirement for cellular respiration of the microorganism within the culture medium is less than the maximum rate of oxygen ~~supply~~ replenishment to the culture medium, the microorganisms will substantially utilize oxygen for cellular respiration, and when the oxygen requirements for cellular respiration of the microorganisms within the culture medium is greater than the maximum rate of oxygen supply to the culture medium, then at least a portion of the microorganism concentration within the culture medium will utilize the alternative oxidant source for cellular respiration;

sustaining cells in the culture medium such that at least a portion of the population consumes said alternative oxidant during at least a port of the production process;

maintaining the culture medium at a suitable pH and temperature for the selected microorganism; and
allowing the culture medium to incubate.

Claim 2 (original): The process of claim 1, further comprising the steps of isolating and recovering said biological product from said culture media.

Claim 3 (original): The process of claim 1, wherein the microorganism is selected from the group consisting of bacteria, yeasts, molds and archaea.

Claim 4 (original): The process of claim 3, wherein the microorganism is a bacteria.

Claim 5 (canceled):

Claim 6 (previously presented): The process of claim 4, wherein the bacteria is selected from a genus selected from the group consisting of *Pseudomonas*, *Paracoccus*, *Micrococcus*, *Klebsiella*, *Escherichia*, *Acidianus*, *Campylobacter*, *Wolinella*, and *Proteus*.

Claim 7 (original): The process of claim 6, wherein the genus is *Pseudomonas*

Claim 8 (original): The process of claim 7, wherein the species of the genus *Pseudomonas* is selected from the group consisting of *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas putida*, *Pseudomonas cruciviae*, *Pseudomonas boreopolis* and *Pseudomonas oleovorans*.

Claim 9 (original): The process of claim 8, wherein the species of *Pseudomonas* is *Pseudomonas aeruginosa*.

Claim 10 (original): The process of claim 1, wherein the carbon substrate is selected from the group consisting of fatty acids, glycerol, low molecular weight acids, carbohydrates, yeast extract, peptone and vegetable oil.

Claim 11 (original): The process of claim 10, wherein the fatty acids are selected from the group consisting of palmitic acid, stearic acid, oleic acid, linoleic acid, arachidic acid, butyric acid, caproic acid, lauric acid, and linolenic acid.

Claim 12 (original): The process of claim 11, wherein the fatty acid is palmitic acid.

Claim 13 (original): The process of claim 10, wherein the vegetable oil is selected from the group

consisting of corn oil, peanut oil, coconut oil, linseed oil, olive oil, soy bean oil and sunflower oil.

Claim 14 (original): The process of claim 13, wherein the vegetable oil is corn oil.

Claim 15 (original): The process of claim 10, wherein the carbohydrate is glucose.

Claim 16 (original): The process of claim 10, wherein the low molecular weight acid is selected from the group consisting of malate, acetate and pyruvate.

Claim 17 (original): The process of claim 1, wherein the alternative oxidant source is selected from the group consisting of nitrates, nitrites, sulfates, sulfites, carbonates, fumarates, sulfur, manganic ion, ferric ion, selenate, dimethyl sulfoxide, arsenate, trimethylamine N-oxide and glycine.

Claim 18 (original): The process of claim 17, wherein the alternative oxidant source is a nitrate.

Claim 19 (original): The process of claim 18, wherein the nitrate is selected from the group consisting of sodium nitrate, potassium nitrate, calcium nitrate, magnesium nitrate, ammonium nitrate, and nitric acid.

Claim 20 (original): The process of claim 19, wherein the nitrate is sodium nitrate.

Claim 21 (original): The process of claim 17, wherein the nitrites are selected from the group consisting of sodium nitrite, potassium nitrite, calcium nitrite, ammonium nitrite, and nitrous acid.

Claim 22 (original): The process of claim 17, wherein the sulfates are selected from the group consisting of sodium sulfate, potassium sulfate, calcium sulfate, iron sulfate, magnesium sulfate, ammonium sulfate, zinc sulfate, copper sulfate, cobalt sulfate, manganese sulfate, and dilute sulfuric acid.

Claim 23 (original): The process of claim 17, wherein the sulfites are selected from the group consisting of calcium sulfite, sodium sulfite, potassium sulfite, iron sulfite, magnesium sulfite, ammonium sulfite, zinc sulfite, copper sulfite, cobalt sulfite and manganese sulfite.

Claim 24 (original): The process of claim 17, wherein the carbonates are selected from the group consisting of calcium carbonate, sodium carbonate, and potassium carbonate.

Claim 25 (original): The process of claim 17, wherein the bicarbonates are selected from the group is consisting of calcium bicarbonate, sodium bicarbonate, and potassium bicarbonate.

Claim 26 (original): The process of claim 17, wherein the fumarates are selected from the group consisting of disodium fumarate, sodium fumarate, dipotassium fumarate, potassium fumarate, and fumaric acid.

Claim 27 (original): The process of claim 1, further comprising the step of adding a sufficient amount of a surfactant to said culture medium to facilitate the mass transfer of said carbon substrate into said culture medium.

Claim 28 (original): The process of claim 1, further comprising the step of limiting an essential growth nutrient from the culture medium.

Claim 29 (original): The process of claim 28, wherein the essential growth nutrient is selected from the group consisting of phosphorous, nitrogen, sulfur, calcium, magnesium and iron.

Claim 30 (original): The process of claim 29, wherein the essential growth nutrient is phosphorous.

Claim 31 (original): The process of claim 1, wherein said cellular concentration of said microorganism is from about 0.1 g/L to about 50 g/L.

Claim 32 (original): The process of claim 1, wherein the concentration of the alternative oxidant source in the culture medium is in the range of from about 0.01 to about 10 g/L.

Claim 33 (original): The process of claim 1, wherein the culture is maintained in a temperature range of about 20°C to about 40 °C.

Claim 34 (original): The process of claim 1, wherein the culture is maintained in a pH range of about 4 to about 9.

Claim 35 (original ~~withdrawn~~): A process for the preparation of biological products under anaerobic respiring conditions comprising:

selecting a microorganism that is capable of utilizing an alternative oxidant source other than oxygen for cellular respiration under anaerobic conditions;

providing a culture medium suitable for the growth of the microorganism, wherein the medium comprises at least one carbon source;

inoculating the culture medium with a desired cellular concentration of the microorganism;

supplying an alternative oxidant source other than oxygen to the culture medium;

maintaining the culture medium at a desired pH and temperature; and

allowing the culture medium to incubate for a time sufficient to produce a desired quantity of a biological product.

Claim 36 (withdrawn): The process of claim 35, further comprising the steps of isolating and recovering said biological product from said culture media.

Claim 37 (withdrawn): The process of claim 35, wherein the microorganism is selected from the group consisting of bacteria, yeasts, mold and archaea.

Claim 38 (withdrawn): The process of claim 37, wherein the microorganism is a bacteria.

Claim 39 (withdrawn): The process of claim 38, wherein the bacteria is selected from the group consisting of obligate anaerobes and facultative aerobes.

Claim 40 (withdrawn): The process of claim 39, wherein the obligate anaerobe is from a genus selected from the group consisting of *Desulfovibrio*, *Desulfomonas*, *Desulfotomaculum*, *Desulfobulbus*, *Desulfococcus*, *Desulfobacter*, *Desulfosarcina*, *Desulfonema*, *Desulfomonas*, *Thermoproteus*, *Pyrococcus*, *Thermococcus*, and *Shewanella*.

Claim 41 (withdrawn): The process of claim 40, wherein the facultative aerobe is from a genus selected from the group consisting of *Pseudomonas*, *Paracoccus*, *Micrococcus*, *Klebsiella*, *Escherichia*, *Acidithiobacillus*, *Campylobacter*, *Wolinella*, *Desulfotomaculum*, *Clostridium*, and *Proteus*.

Claim 42 (withdrawn): The process of claim 41, wherein the genus is *Pseudomonas*.

Claim 43 (withdrawn): The process of claim 42, wherein the species of the genus *Pseudomonas* is selected from the group consisting of *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas putida*, *Pseudomonas cruciviae*, *Pseudomonas boreopolis* and *Pseudomonas oleovorans*.

Claim 44 (withdrawn): The process of claim 43, wherein the species of *Pseudomonas* is *Pseudomonas aeruginosa*.

Claim 45 (withdrawn): The process of claim 35, wherein the carbon substrate is selected from the group consisting of fatty acids, glycerol, low molecular weight acids, carbohydrates, yeast extract, peptone and vegetable oil.

Claim 46 (withdrawn): The process of claim 45, wherein the fatty acids are selected from the group consisting of palmitic acid, stearic acid, oleic acid, linoleic acid, lauric acid, butyric acid, caproic acid, lauric acid, and linolenic acid.

Claim 47 (withdrawn): The process of claim 46, wherein the fatty acid is palmitic acid.

Claim 48 (withdrawn): The process of claim 45, wherein the vegetable oil is selected from the group consisting of corn oil, peanut oil, coconut oil, linseed oil, olive oil, soy bean oil and sunflower oil.

Claim 49 (withdrawn): The process of claim 48, wherein the vegetable oil is corn oil.

Claim 50 (withdrawn): The process of claim 45, wherein the carbohydrate is glucose.

Claim 51 (withdrawn): The process of claim 45, wherein the low molecular weight acid is selected from the group consisting of malate, acetate and pyruvate.

Claim 52 (withdrawn): The process of claim 35, wherein the alternative oxidant is selected from the group consisting of nitrates, nitrites, sulfates, sulfites, carbonates, fumarates, sulfur, manganic ion, ferric ion, selenate, dimethyl sulfoxide, arsenate, trimethylamine N-oxide and glycine.

Claim 53 (withdrawn): The process of claim 52, wherein the alternative oxidant source is a nitrate.

Claim 54 (withdrawn): The process of claim 53, wherein the nitrate is selected from the group consisting of sodium nitrate, potassium nitrate, calcium nitrate, magnesium nitrate, ammonium nitrate, and nitric acid.

Claim 55 (withdrawn): The process of claim 54, wherein the nitrate is sodium nitrate.

Claim 56 (withdrawn): The process of claim 35, wherein the nitrites are selected from the group consisting of sodium nitrite, potassium nitrite, calcium nitrite, ammonium nitrite, and nitrous acid.

Claim 57 (withdrawn): The process of claim 35, wherein the sulfates are selected from the group consisting of sodium sulfate, potassium sulfate, calcium sulfate, iron sulfate, magnesium sulfate, ammonium sulfate, zinc sulfate, copper sulfate, cobalt sulfate, manganese sulfate, and dilute sulfuric acid.

Claim 58 (withdrawn): The process of claim 35, wherein the sulfites are selected from the group consisting of calcium sulfite, sodium sulfite, potassium sulfite, iron sulfite, magnesium sulfite, ammonium sulfite, zinc sulfite, copper sulfite, cobalt sulfite and manganese sulfite.

Claim 59 (withdrawn): The process of claim 35, wherein the carbonates are selected from the group consisting of calcium carbonate, sodium carbonate, and potassium carbonate.

Claim 60 (withdrawn): The process of claim 35, wherein the bicarbonates are selected from the group consisting of calcium bicarbonate, sodium bicarbonate, and potassium bicarbonate.

Claim 61 (withdrawn): The process of claim 35, wherein the fumarates are selected from the group consisting of disodium fumarate, sodium fumarate, dipotassium fumarate, potassium fumarate, and fumaric acid.

Claim 62 (withdrawn): The process of claim 35, further comprising the step of adding a sufficient amount of a surfactant to said culture medium to facilitate the mass transfer of said carbon substrate into said culture medium.

Claim 63 (withdrawn): The process of claim 35, further comprising the step of limiting an essential growth nutrient from the culture medium.

Claim 64 (withdrawn): The process of claim 63, wherein the essential growth nutrient is selected from the group consisting of phosphorous, nitrogen, sulfur, calcium, magnesium and iron.

Claim 65 (withdrawn): The process of claim 64, wherein the essential growth nutrient is phosphorous.

Claim 67 (withdrawn): The process of claim 35, wherein said cellular concentration of the microorganism in the culture medium is in the range of from about 0.1 g/L to about 50 g/L.

Claim 68 (withdrawn): The process of claim 35, wherein the concentration of the alternative oxidant source in the culture medium is in the range of from about 0.01 to about 10 g/L.

Claim 69 (withdrawn): The process of claim 35, wherein the culture is maintained in a temperature range of about 20°C to about 40 °C.

Claim 70 (withdrawn): The process of claim 35, wherein the culture is maintained in a pH range of about 4 to about 9.

Claim 71 (currently amended): A process for increasing concentration of a microorganism in a ~~defined~~ medium comprising the steps of:

~~selecting~~ providing a microorganism having the ability to produce a biological product, the microorganism being capable of utilizing oxygen and an alternative oxidant source other than oxygen for cellular respiration;

providing a culture medium suitable for the growth of the microorganism, wherein the medium comprises at least one carbon source;

inoculating the culture medium with a desired cellular concentration of the microorganism;

aerating the culture medium with oxygen, wherein the process has a maximum oxygen ~~supply~~ replenishment rate to the culture medium;

supplying the culture medium with a suitable amount of the alternative oxidant source that can be used by the microorganism, such that when the oxygen requirements for cellular respiration of the microorganism within the culture medium is less than the maximum rate of oxygen supply to the culture medium, then the microorganism will substantially utilize oxygen for cellular respiration, and when the oxygen requirements for cellular respiration of the microorganism within the culture medium is greater than the maximum rate of oxygen supply to the culture medium, then at least a portion of the microorganism concentration within the culture medium will utilize the alternative oxidant source for

cellular respiration;

maintaining the culture medium at a desired pH and temperature; and

allowing the culture medium to incubate.

Claim 72 (new): A reduced-foaming process for the production of a biological product by a microorganism comprising the steps of:

providing a microorganism that produces the biological product, and is capable of using oxygen and an alternative oxidant source other than oxygen for cellular respiration;

providing a culture medium suitable for the growth of the microorganism, wherein the medium has a tendency to foam during aeration;

inoculating the culture medium with a cellular concentration of the microorganism;

aerating the culture medium at a rate resulting in a lack of a need for items selected from the group consisting of anti-foaming agents and foam controlling mechanical apparatus; and

supplying the culture medium with an amount of the alternative oxidant source suitable to maintain the population so that when the oxygen requirement for cellular respiration is less than the rate of oxygen replenishment to the culture medium, the microorganisms will substantially utilize oxygen for cellular respiration, but when the oxygen requirement for cellular respiration is greater than the rate of oxygen replenishment to the culture medium, at least a portion of the microorganisms will utilize the alternative oxidant source for cellular respiration.

Claim 73 (new): The process of claim 72, further comprising the steps of isolating and recovering said biological product from said culture media.

Claim 74 (new): The process of claim 72, wherein the microorganism is selected from the group consisting of bacteria, yeasts, molds and archaea.

Claim 75 (new): The process of claim 74, wherein the microorganism is a bacteria.

Claim 76 (new): The process of claim 75, wherein the bacteria is selected from the group consisting of *Pseudomonas*, *Paracoccus*, *Micrococcus*, *Klebsiella*, *Escherichia*, *Acidianus*,

Campylobacter, *Wolinella*, and *Proteus*.

Claim 77 (new): The process of claim 76, wherein the genus is *Pseudomonas*

Claim 78 (new): The process of claim 77, wherein the species of the genus *Pseudomonas* is selected from the group consisting of *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Pseudomonas putida*, *Pseudomonas cruciviae*, *Pseudomonas boreopolis* and *Pseudomonas oleovorans*.

Claim 79 (new): The process of claim 78, wherein the species of *Pseudomonas* is *Pseudomonas aeruginosa*.

Claim 80 (new): The process of claim 72, wherein the carbon substrate is selected from the group consisting of fatty acids, glycerol, low molecular weight acids, carbohydrates, yeast extract, peptone and vegetable oil.

Claim 81 (new): The process of claim 80, wherein the fatty acids are selected from the group consisting of palmitic acid, stearic acid, oleic acid, linoleic acid, arachidic acid, butyric acid, caproic acid, lauric acid, and linolenic acid.

Claim 82 (new): The process of claim 81, wherein the fatty acid is palmitic acid.

Claim 83 (new): The process of claim 80, wherein the vegetable oil is selected from the group consisting of corn oil, peanut oil, coconut oil, linseed oil, olive oil, soy bean oil and sunflower oil.

Claim 84 (new): The process of claim 83, wherein the vegetable oil is corn oil.

Claim 85 (new): The process of claim 80, wherein the carbohydrate is glucose.

Claim 86 (new): The process of claim 80, wherein the low molecular weight acid is selected from the group consisting of malate, acetate and pyruvate.

Claim 87 (new): The process of claim 72, wherein the alternative oxidant source is selected from the group consisting of nitrates, nitrites, sulfates, sulfites, carbonates, fumarates, sulfur, manganic ion, ferric ion, selenate, dimethyl sulfoxide, arsenate, trimethylamine N-oxide and glycine.

Claim 88 (new): The process of claim 87, wherein the alternative oxidant source is a nitrate.

Claim 89 (new): The process of claim 88, wherein the nitrate is selected from the group consisting of sodium nitrate, potassium nitrate, calcium nitrate, magnesium nitrate, ammonium nitrate, and nitric acid.

Claim 90 (new): The process of claim 89, wherein the nitrate is sodium nitrate.

Claim 91 (new): The process of claim 87, wherein the nitrites are selected from the group consisting of sodium nitrite, potassium nitrite, calcium nitrite, ammonium nitrite, and nitrous acid.

Claim 92 (new): The process of claim 87, wherein the sulfates are selected from the group consisting of sodium sulfate, potassium sulfate, calcium sulfate, iron sulfate, magnesium sulfate, ammonium sulfate, zinc sulfate, copper sulfate, cobalt sulfate, manganese sulfate, and dilute sulfuric acid.

Claim 93 (new): The process of claim 87, wherein the sulfites are selected from the group consisting of calcium sulfite, sodium sulfite, potassium sulfite, iron sulfite, magnesium sulfite, ammonium sulfite, zinc sulfite, copper sulfite, cobalt sulfite and manganese sulfite.

Claim 94 (new): The process of claim 87, wherein the carbonates are selected from the group consisting of calcium carbonate, sodium carbonate, and potassium carbonate.

Claim 95 (new): The process of claim 87, wherein the bicarbonates are selected from the group consisting of calcium bicarbonate, sodium bicarbonate, and potassium bicarbonate.

Claim 96 (new): The process of claim 87, wherein the fumarates are selected from the group consisting of disodium fumarate, sodium fumarate, dipotassium fumarate, potassium fumarate, and fumaric acid.

Claim 97 (new): The process of claim 72, further comprising the step of adding a sufficient amount of a surfactant to said culture medium to facilitate the mass transfer of said carbon substrate into said culture medium.

Claim 98 (new): The process of claim 72, further comprising the step of limiting an essential growth nutrient in the culture medium.

Claim 99 (new): The process of claim 98, wherein the essential growth nutrient is selected from the group consisting of phosphorous, nitrogen, sulfur, calcium, magnesium and iron.

Claim 100 (new): The process of claim 99, wherein the essential growth nutrient is phosphorous.

Claim 101 (new): The process of claim 72, wherein said cellular concentration of said microorganism is from about 0.1 g/L to about 50 g/L.

Claim 102 (new): The process of claim 72, wherein the concentration of the alternative oxidant source in the culture medium is in the range of from about 0.01 to about 10 g/L.

Claim 103 (new): The process of claim 72, wherein the culture is maintained in a temperature range of about 20 °C to about 40 °C.

Claim 104 (new): The process of claim 72, wherein the culture is maintained in a pH range of

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about 4 to about 9.